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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/535,311

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Masakazu Funahashi

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EXAMINER

YAMNITZKY, MARIE ROSE

ART UNIT

PAPER NUMBER

1794

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/535,311	<b>Applicant(s)</b> FUNAHASHI ET AL.	
	<b>Examiner</b> Marie R. Yamnitzky	<b>Art Unit</b> 1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 28 September 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 3,5-8,10-13 and 26-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 3,5-8,10-13 and 26-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

Art Unit: 1794

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's amendment filed on August 26, 2009, which amends claims 3, 5-8 and 10-13, cancels claims 1, 2, 14, 15, 17, 18 and 20-25, and adds claims 26-36, has been entered.

Claims 3, 5-8, 10-13 and 26-36 are pending.

2. The rejections under 35 U.S.C 112, 1<sup>st</sup> paragraph, as set forth in the Office action mailed May 27, 2009 are partly rendered moot by claim cancellation and otherwise overcome by claim amendment.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 3, 5-8, 10-13 and 26-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakai et al. (US 2002/0136922 A1) with evidence provided by Hosokawa et al. (US 7,087,322 B2).

Sakai et al. provide examples of organic electroluminescent devices comprising a light-emitting layer between a pair of electrodes wherein the light-emitting layer comprises a combination of three materials: Sakai's bisanthracene compound 6-1, which is a phenylanthracene derivative similar to present applicant's compound H1 and meets the limitations recited in claims 7, 8, 10, 11, 30, 31 and 32, DPVDPAN, which is a condensed aromatic ring compound and is present applicant's compound H2 and meets the limitations recited in claims 5, 7 and 28, and DMPAVB, which is a styrylamine derivative and is present applicant's compound D1 and meets the limitations recited in claims 5, 7 and 28. See Sakai's examples 1 and 2 (pages 8-9). The devices of these examples further comprise a layer between the light emitting layer and the anode which meets the limitations recited in claims 13 and 34.

With respect to the three materials in the light emitting layer of Sakai's examples 1 and 2, the examiner compares compound 6-1 to the presently required light-emitting-layer material, DPVDPAN to the presently required first dopant, and DMPAVB to the presently required second dopant.

Sakai et al. do not explicitly disclose the valence electron level, conduction level or energy gap of the three materials. However, based on Sakai's teachings as well as the data set forth in Table 1 of the present specification, and the data set forth in Table 1 of the patent to Hosokawa et al., it is reasonable to expect that the combination of materials used in Sakai's Examples 1 and 2 inherently meets most of the relations set forth in the present claims as described below. With respect to Hosokawa's data, ionization energy correlates to valence electron level and electron affinity correlates to conduction level. Energy gap is the difference

between valence electron level/ionization energy and conduction level/electron affinity.

Hosokawa's compound E2 is Sakai's compound 6-1. Hosokawa also provides data for several other compounds that are disclosed in the present specification (for example, Hosokawa's compound E1 is applicant's compound H2, and Hosokawa's compounds D2 and D4 are applicant's compounds D2 and D3, respectively). Although Hosokawa's values differ slightly from those set forth in the present specification for the same compounds, the values are sufficiently close such that Hosokawa's data concerning compound E2 can be used to reasonably establish that Sakai's combination of compound 6-1, DPVDPAN and DMPAVB meets most of the relations set forth in the present claims.

With respect to energy gap, Sakai et al. teach in paragraph [0028] that it is preferred that the compound of Sakai's general formula (2) have a greater energy gap than the energy gap of the light-emitting material of Sakai's general formula (1), and teach in paragraph [0036] that a fluorescent molecule may be used in combination with the other two compounds and preferably has an energy gap that is smaller than that of the light-emitting material, thus suggesting the relationship of  $EG_0 > EG_1$  and  $EG_0 > EG_2$ . Further, given the data provided in the specification and the data provided in the patent to Hosokawa et al., it is reasonable to expect that the combination of three materials used in the light emitting layer of Sakai's Examples 1 and 2 inherently meets relation (C') of present claim 26 and dependents, and inherently meets relation (C) of present claim 35 and dependents. Based on the data provided in the present specification, DPVDPAN has an energy gap of 2.9 and DMPAVB has an energy gap of 2.8, and based on the data provided in the patent to Hosokawa et al., Sakai's compound 6-1 has an energy gap that is

greater than the energy gap of DPVDPAN and DMPAVB. Further, given Sakai's disclosure, it is reasonable to expect that both DPVDPAN and DMPAVB in Sakai's Examples 1 and 2 emit light as per present claims 3 and 27.

Given the data provided in the specification and the data provided in the patent to Hosokawa et al., it is also reasonable to expect that the combination of three materials used in the light emitting layer of Sakai's Examples 1 and 2 inherently meets relation (A') of present claim 26 and dependents and inherently meets relation (A) of present claim 35 and dependents, inherently meets relation (B) of present claim 35 and dependents, and meets the limitations recited in claims 6 and 29.

With respect to present claim 26 and dependents, Sakai's devices of Examples 1 and 2 do not meet the dopant concentration limitation set forth in the last two lines of claim 26, do not meet relation (B') as set forth in claim 26, and do not meet the further limitations of claim 33.

With respect to present claim 35 and dependents, Sakai's devices of Examples 1 and 2 do not meet the dopant concentration limitation set forth in the last two lines of claim 35, do not meet relation (B') set forth in claim 36 (with claim 3 dependent therefrom), and do not meet the further limitations of claim 12.

Regarding the dopant concentration, DMPAVB is used in Sakai's Examples 1 and 2 in an amount of 3% by weight of the layer. However, DPVDPAN is used in an amount of about 69% based on the weight of the layer in Example 1, and in an amount of about 48% based on the weight of the layer in Example 2. However, making similar devices having lesser amounts of DPVDPAN would have been an obvious modification to one of ordinary skill in the art at the

time of the invention given, for example, Sakai's teachings in paragraphs [0015] and [0033]. DPVDPAN is a compound of Sakai's light emitting material of general formula (1). The teachings in paragraph [0033] suggest lower amounts of DPVDPAN than used in Examples 1 and 2, and even lower amounts are suggested by Sakai's teaching in paragraph [0015] that more than one material of general formula (1) may be used. The present claims do not limit the composition of the light emitting layer to three materials, and do not limit valence electron level and/or conduction level and/or energy gap for any further materials that the light emitting layer may comprise.

With respect to relation (B') as set forth in present claims 26 and 36, based on the data provided in the Hosokawa patent and the present specification, Sakai's Examples 1 and 2 inherently meet the EC0 vs. EC2 relationships, but do not meet  $EC0 \geq EC1$ . Instead, the conduction level of Sakai's compound 6-1 is slightly smaller (by 0.07 eV) than the conduction level of DPVDPAN. (Sakai's compound 6-1 is Hosokawa's compound E2, and Sakai's DPVDPAN is Hosokawa's compound E1. Electron affinity correlates to conduction level.) However, the values are so similar that one of ordinary skill in the art at the time of the invention would have reasonably expected that devices wherein EC0 is only 0.07 eV less than EC1 would function in a similar manner to a device in which  $EC0=EC1$  (as within the scope of present relation (B')), or in which EC0 is only slightly larger than EC1 (as within the scope of present relation (B')). In this regard, the examiner notes that there is insufficient data of record to demonstrate that devices meeting all claim limitations and in which the EC0 is the same as, or

Art Unit: 1794

only slightly larger than, EC1, are unexpectedly superior to devices meeting all claim limitations except relation (B'), but in which EC0 is only slightly smaller than EC1.

With respect to the further limitations of present claims 12 and 33, Sakai's bisanthracene compound 6-1, which is a phenylanthracene derivative, does not contain an alkenyl group. However, Sakai et al. do disclose a specific example of a bisanthracene compound that is a phenylanthracene derivative and contains an alkenyl group (Sakai's compound 4-19). Absent a showing of unexpected results, it is the examiner's position that it would have been within the level of ordinary skill of a worker in the art at the time of the invention to determine suitable substituted derivatives to provide a device within Sakai's guidelines.

5. Applicant's arguments filed May 27, 2009 have been fully considered but they are not persuasive with respect to the prior art rejection.

The examiner maintains the position that amounts of DPVDPAN lower than the amounts used in Sakai's Examples 1 and 2 would have been obvious to one of ordinary skill in the art given Sakai's teachings. Applicant argues that in paragraph [0033], Sakai discloses no less than 40% [by weight] of the light emitting material. While paragraph [0033] teaches that the weight ratio of the light emitting material (a compound of Sakai's general formula (1), such as DPVDPAN) to the bis-condensed aromatic cyclic compound (a compound of Sakai's general formula (2, such as Sakai's compound 6-1)) is preferably in the range of 100:1 to 40:60, combinations of two or more compounds of general formula (1) may be included in the layer. When more than one compound of general formula (1) is used in the layer, each compound of

formula (1) is present in a smaller amount relative to the total weight of the layer. For example, if two compounds of general formula (1) are included in the layer in equal weight amounts, and the weight ratio of the compounds of formula (1) to the compounds of formula (2) is 40:60, the content of each compound of general formula (1) is only 20 weight % based on the total weight of compounds of formula (1) and compounds of formula (2). The light emitting layer of the present claims requires three materials, but the claim language is not closed to the presence of additional materials in the light emitting layer.

Further, the examiner has considered the data of record in the specification and is of the position that the data do not demonstrate unexpected results commensurate in scope with the claims. The data of record do not demonstrate that the dopant concentration limitations of the present claims are critical and provide unexpected results compared to similar devices in which the content of one of the first and second dopants is greater than 20 wt% of the light emitting layer. Each of the exemplary devices within the scope of the present claims has a light emitting layer consisting of three materials, with the materials corresponding to the first and second dopants each being present in an amount of about 2 wt% of the layer. These devices are compared to comparative devices in which the light emitting layer comprises only one of the presently required first and second dopants, and that dopant is present in an amount of about 2 wt% of the layer. While the data demonstrate that the presence of three materials in the light emitting layer provides superior results compared to similar devices having only two materials in the light emitting layer, there is no evidence of record to demonstrate that devices within the scope of the claims provide unexpected results compared to similar devices having three

Art Unit: 1794

materials in which only one material is present in an amount of 20 wt% or less of the layer (as in Sakai's devices of Examples 1 and 2).

6. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 7:00 a.m. to 3:30 p.m. Monday and Wednesday-Friday.

The current fax number for all official faxes is (571) 273-8300. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

/Marie R. Yamnitzky/  
Primary Examiner, Art Unit 1794

MRY  
December 17, 2009